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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/507,521	02/18/2000	Min Xie	15-CT-5271	7950

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EXAMINER	
DO, CHAT C	

ART UNIT	PAPER NUMBER
2124	18

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/507,521	XIE ET AL.	
	Examiner	Art Unit	
	Chat C. Do	2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,3,5-11,13-17,19-25 and 27-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,3,5-11,13-17,19-25 and 27-31* is/are rejected.

7)☒ Claim(s) *32-35* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02/18/00* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s).

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is responsive to Amendment E, filed 11/17/2003.

2. Claims 2-3, 5-11, 13-17, 19-25, and 27-31 are pending in this application. Claims 31 and 15 are independent claims. In the Amendment E, claims 15 and 31 are amended. This action is made non-final after a Request for Continued Examination filed.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations cited in the independent claims 15 and 31 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 13-14 and 19-20 are objected to because of the following informalities:

Claims 19-20 have exactly the same limitations cited in claims 13-14. However, these set of claims {13-14} and {19-20} both are dependent claims of claim 33. Therefore, the applicant is advised to remove either set of claims {13-14} or {19-20} in order to avoid any claim duplication.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2-3, 5-11, 13-17, 19-25, and 27-35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 31, the limitation "a mantissa region" in line 3 is unclear whether a mantissa region is a mantissa value of intended "point" x wherein $x = m * 2^e$ or a mantissa region is a region of natural logarithm function. For examination purposes, the examiner considers the limitation "a mantissa region" as a bounded region in a natural logarithm function. In addition, it is mis-descriptive by the limitation "wherein log(x) is a function of a distance between a_i and the mantissa" in line 12 because the log(x) is a single value as clearly cited in the claim line 10. For examination purposes, the examiner disregards the limitation. Claim 15 has the same problem as cited above.

Thus, claims 2-3, 5-11, 13-14, 16-17, 19-25, 27-30, and 32-35 are also rejected for being dependent on the rejected based claims 15 and 31.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 2-3, 7, 15-17, 21, and 31 are rejected under 35 U.S.C. 103(a) as being obvious over Smith (U.S. 5,570,310) in view of Watson (U.S. 5,629,780).

Re claims 15 and 31, Smith discloses a method in Figure 3 for computing (equation 10) for a natural logarithm function. The method comprises the following steps: partitioning of mantissa (col. 3 lines 65-67 and col. 4 lines 1-5 where i is the index of that sub-region as described in equation 13) between 1 and 2 into N equally spaced sub-regions, precomputing ai (col. 4 lines 17-18) of each of N equally spaced sub-regions where i = 0 to N-1, selecting N sufficiently large (col. 4 lines 1-10) so that the first degree polynomial in computation of log(m) within a preselected degree of accuracy, and computing (abstract) a value of log(x) for binary floating point representation of a particular number x stored in a memory of a computing device. Smith does not disclose the precomputing point ai is the centerpoint of each of the sub-region. Smith does not discloses the computation of approximation of log(x) using first degree polynomial in m and the computation of log(x) is used to generate an image. However, Watson discloses a method of determining a value using a mid-point within a region for minimizing the error (col. 10 lines 30-35) and the computation is used to generate an image. In addition, it is well known in the art to use Taylor series to approximate a value. In order to minimize the computation process, the approximation of log(m) using Taylor series is utilizing the first degree polynomial of the Taylor series. Therefore, it would have been obvious to a person having ordinary skill in the art to use first order Taylor series to

approximate the log(m) function, using the mid-point ai as the preference point, and the computation is used to generate an image as seen in Watson's invention into Smith's invention because it would enable to reduce the computation time and the region error.

Re claims 2-3, 7, 16-17, and 21, Smith discloses the method in Figure 3 for computing a natural logarithm function wherein the input number x (col. 1 lines 58-65) has a binary exponent in addition to the binary mantissa m. Smith discloses the steps of computing a value of log(x) by partitioning a mantissa m of binary representation of x in a memory (220 and 260) and precomputed value of log(ai) (280). Smith does not directly disclose that the Δx is computed from mantissa m to reference mid-point ai and the computation of log(x) using a polynomial of first degree in m. However, Watson discloses a method of determining a value using a mid-point within a region for minimizing error (col. 10 lines 30-35). In addition, it is well known in the art to use Taylor series to approximate a value. The equation in claim 3 is the first order approximation of log(m) using Taylor series where $\log(m) = \log(ai) + \Delta x/ai$. Therefore, it would have been obvious to a person having ordinary skill in the art to use first order Taylor series to approximate the log(m) function and using the mid-point ai as the preference point because it would reduce the computation time and the region error.

9. Claims 8-11, 22-25, and 29-30 are rejected under 35 U.S.C. 103(a) as being obvious over Smith (U.S. 5,570,310) in view of Watson (U.S. 5,629,780), as applied to claims 15 and 31, in further view of Wallschlaeger (U.S. 5,345,381).

Re claims 8-9, 22-23, and 29-30, Smith in view of Watson discloses the above method for computing a natural logarithm function. Smith in view of Watson does not disclose the above method can be utilized in a computed tomography scanner as in image reconstructor for generating an image of an object from acquired projection data of the object. However, Wallschlaeger discloses the use of logarithm function (col. 1 lines 35-40) in a computed tomography scanner (Figure 1) as in image reconstructor (col. 1 lines 25-35) for generating an image of an object by manipulating the intensity values (Figure 3). Therefore, it would have been obvious application o a person having ordinary skill in the art to use the method of logarithm function in tomography scanner as in image reconstructor for generating an image of an scanned object as seen in Wallschlaeger's invention into Smith in view of Watson's invention because the Smith in view of Watson's logarithm function method would enable to yield faster results and less error.

Re claims 10-11 and 24-25, Smith in view of Wallschlaeger discloses the method in for computing a natural logarithm function in tomography scanner wherein the input number x (col. 1 lines 58-65) has a binary exponent in addition to the binary mantissa m. Smith in view of Wallschlaeger discloses the steps of computing a value of log(x) by partitioning a mantissa m of binary representation of x in a memory (220 and 260) and precomputed value of log(ai) (280). Smith in view of Wallschlaeger does not directly disclose that the Δx is computed from mantissa m to reference mid-point ai and the computation of log(x) using a polynomial of first degree in m. However, Watson discloses a method of determining a value using a mid-point within a region for minimizing error (col. 10 lines 30-35). In addition, it is well known in the art to use

Taylor series to approximate a value. The equation in claim 3 is the first order approximation of log(m) using Taylor series. Therefore, it would have been obvious to a person having ordinary skill in the art to use first order Taylor series to approximate the log(m) function and using the mid-point ai as the preference point as seen in Watson' invention into Smith in view of Wallschlaeger's invention because it would enable to reduce the computation time and the region error.

Allowable Subject Matter

10. Claims 5-6, 13-14, 19-20, 27-28, and 32-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments with respect to claims 8-11, 22-25, and 29-30 have been considered but are moot in view of the new ground(s) of rejection.

12. Applicant's arguments filed 11/17/2003 have been fully considered but they are not persuasive.

a. The applicant argues in pages 14-15 for claims 15 and 31 that neither Smith nor Watson discloses the limitations cited in the independent claims. In particular, neither Smith nor Watson discloses a computing device configured to compute a value of log f(x) utilizing a first degree polynomial in m.

The examiner respectfully submits that the above rejection under 103 clearly state all the limitations cited in the claims 15 and 31. As clearly disclosed by Smith reference in abstract, $\log_p(x)$ is computed utilizing $\log_p(y)$ wherein y is a mantissa/fraction portion of x. $\log_p(y)$ is computed by a first polynomial $-\log_p(a) + \log_p(1+(ay-1))$.

b. The applicant argues in pages 16-17 that the obviousness cannot be established by merely suggesting that it would have been obvious to one of ordinary skill in the art to modify Smith according to the teaching of the Watson because Smith is cited for its teaching that a closest approximation to the logarithm is obtained by evaluating $\log(y) = -\log(a) + \log(1+(ay-1))$ and $\log(x) = k\log(2) + \log(y)$ wherein Watson is cited for its teaching a bisection method.

The examiner respectfully submits that the obviousness is made based purely on the claim language stated in claims 15 and 31. The independent claims do not clearly recite how the log(m) is computed and the detail of evaluating a value using a mid-point as asserted by the applicant, rather they only recite that the log(m) is computed by utilizing a first degree polynomial and the mid-point a_i is determined and computed. The cited reference Smith clearly disclose the log(y) (equivalent to log(m)) is computed using a first degree polynomial ($\log(a) + \log(1+(ay-1))$) in a whole region and Watson discloses a known step/method called bisection in sub-region to reduce the computed error as recited in the instant claims. Therefore, it would have obvious to combine a method of Watson called bisection method into Smith computation of log(x) in order to further

reduce the convergence error, as pointed out in the rejection. Applicant has not pointed out any error in the obviousness statement including the specific motivation set forth by the examiner in the previous action and maintained herein. Therefore the rejection of claims in view of Smith and Watson is proper.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

c. U.S. Patent No. 6,567,831 to Loginov discloses a computer system and method for parallel computations using table approximation.

d. U.S. Patent No. 5,068,816 to Noetzel discloses an interpolating memory function evaluation.

e. U.S. Patent No. 6,363,405 to Loginov discloses a computer system and method for parallel computations using table approximation methods.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2124

February 17, 2004

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SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100